NASA Facts

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YF-23 and NASA Dryden

NASA's Dryden Flight Research Center, Edwards, California, plans to use a YF-23 Advanced Tactical Fighter prototype in a project to extensively study strain gage loads calibration techniques. The YF-23 prototype is one of two designed and built by the contractor team of Northrop and McDonnell Douglas as part of the demonstration and evaluation phase of the U.S. Air Force's Advanced Tactical Fighter selection program. Both YF-23 prototypes have been transferred from Northrop to the NASA Dryden facility at Edwards. Only one will be used in the calibration techniques study. The other will remain in storage at NASA Dryden. There are no engines in the two aircraft, and NASA has no plans to fly the YF-23s in any research program. Transfer of the aircraft from Northrop to NASA was at no cost to the government.

Strain gages are used to measure loads on aircraft structures and components. Data produced from ground tests are used to derive shear, bending moment, and torque loads equations. The loads equations are then used to measure the aircraft loads in flight. Flight loads measurement is an important element of flight safety and aircraft certification. The objective of the NASA Dryden study is to improve the accuracy of current calibration methods. The YF-23 is being used in the study because it is built primarily of composite materials and represents the state-of-the-art in aircraft materials and construction concepts. NASA Dryden will also be receiving an F-16 airframe from the U.S. Air Force for the study. F-16s are built primarily of aluminum and will represent conventional materials and structural concepts in the NASA study.

NASA has identified a need among other government agencies and the aerospace industry to study present methods of strain gage loads calibration techniques that were developed by NACA (National Advisory Committee on Aeronautics) in the 1950s. NACA is the predecessor agency of today's NASA. In the 1950s, analytical tools such as finite element models and high-speed electronic computers were not in existence and strain gage calibration was essentially an experimental technique. In the 1970s, a study was performed by NASA to assess the feasibility of using finite element models to derive – analytically – loads equations using computers of that era and compare the results to the experimental technique. The results were promising, but they also indicated a need for further research. It is believed that with today's analytical capabilities and computers, the experimental strain gage loads calibration process can be enhanced by the use of analytical tools, thus both improving the accuracy of the equations and thereby reducing the cost of loads calibration tests needed on most aircraft research and test projects. The study is expected to take three to four years, with final results openly published and made available to other government agencies and the aerospace industry. Total cost of the study is estimated to be about $250,000.

The study will be carried out in the Dryden Thermostructural Laboratory, and is expected to begin in the latter part of 1994.

The YF-23 prototypes are 67.4 feet in length and have wingspans of 43.6 ft. During the ATF program, one YF-23 was powered by twin Pratt and Whitney YF119 turbofan engines, while two General Electric YF120 turbofan engines were installed in the other prototype. The aircraft achieved a speed of Mach 1.8 during the program.

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